Recognition of an Eastern Pacific *Macoma* in the Coralline Crag of England and its Biogeographic Significance

BY

EUGENE V. COAN

Department of Biological Sciences, Stanford University
Stanford, California 94305

Evidence has been accumulating over the last few years that Bering Strait was open during the late Miocene, closed through most of the Pliocene, then open and closed several times from the late Pliocene through the Pleistocene. These submergences allowed the exchange of marine life, chiefly from the Pacific to the Atlantic Oceans (MacNeil, 1965; Hopkins, 1967).

Pacific elements in the Coralline Crag of England, of Astian (Pliocene) age (Baden-Powell, 1960), may represent either late arrivals from the late Miocene submergence (Hopkins, personal communication) or early arrivals from the late Pliocene submergence (Zullo, personal communication). The larger influx (in terms of the number of species) of Pacific elements present in the Red Crag (Pleistocene) of England and similar deposits on the mainland of Europe and in Iceland may represent either an event of submergence in the Bering Strait area or similar tectonic events in the Canadian archipelago (Hopkins, 1967).

In connection with a revision of the Eastern Pacific Tellinacea, I can now report further evidence concerning the trans-Aretic migrations of mollusks. The boreal species of the genus *Macoma*, with a geological record from the Eocene to the Recent in the Eastern Pacific (Keen & Bentson, 1944), have recently been discussed as not having reached the Atlantic Ocean until the Pleistocene influx (Durham & MacNeil *in* Hopkins, 1967). I find that *M. obliqua* (Sowerby, 1817)[1], reported from the Coralline Crag of England (Wood, 1848, 1874; British Museum [Natural History], 1963) and from the correlative, Sealdisian strata in Belgium (Glibert, 1958a, b), is conspecific with a Recent West American boreal species, commonly identified with *M. incongrua* (von Martens, 1865)[2].

Macoma lyelli Dall, 1894, described from the late Miocene or early Pliocene of Marthas Vineyard, Massachusetts (also Dall, 1900b), and *M. cookei* Gardner, 1943, described from the Upper Miocene of Virginia seem to be closely related.

As Recent and fossil Eastern Pacific specimens of *Macoma obliqua* differ significantly from Recent material from Japan, type locality of *M. incongrua*, the Western Pacific form should be regarded as a distinct subspecies or species. *Macoma obliqua* has become extinct in the North Atlantic since the Pleistocene.

---

[1] *Tellina obliqua* J. Sowerby, 1817, *non* Wood, 1815. The International Commisson on Zoological Nomenclature has been petioned to conserve the name of this well-known Cenozoic fossil which has only recently been discovered to be a junior homonym of an unimportant junior subjective synonym. Type specimens of the Sowerby species are in the British Museum (Natural History), and Stanford University now has specimens from the Red Crag which have been compared with this type material.

[2] *Tellina incongrua* von Martens, 1865. A potential lectotype, measuring 25.4 mm in length, is in the Zool. Mus., Humboldt Univ., Berlin, no. 7624. Synonyms appear to be *Tellina nasuta truncata* Middendorff, 1851, *non* Linnaeus, 1767, and *T. nasuta brevior* Schrenck, 1867. *Macoma frigida* (Hanley, 1844), described from Kamchatka, seems to be a closely-related, but distinct species.

Dall (1900a) suggested that *Tellina rotundata* Sowerby, 1867, might be a synonym of *Macoma incongrua*. The type specimen in the BM(NH) proves to be *M. balthica* (Linnaeus, 1758). He also suggested that *M. californiensis* Bertin, 1878, was a synonym. Photographs of the type specimens of the latter, kindly provided by l'École des Mines, Paris, prove these to be *Macalia brugueri* (Hanley, 1844), mislabeled as to locality, for the species is Asian.

The synonymy of *Macoma obliqua* and the West American *M. incongrua* of authors, foreshadowed by the association of the two names in the Pleistocene of Iceland (EINARSSON, HOPKINS, & DOEL *in* HOPKINS, 1967), suggests that migrations from the Pacific to the Atlantic during the first Cenozoic submergence of Bering Strait in the late Miocene may have been more extensive in terms of the number of species involved than previously thought (as listed by DURHAM & MACNEIL *in* HOPKINS, 1967). West American paleontologists and marine molluscan systematists will have to take into account this exchange and the resulting nomenclatural involvements with European and Atlantic fossil species.

I would also suggest that the isolation created by the Pliocene land bridge subsequent to the late Miocene sea passage may partially explain the presence of so many boreal species of some genera, such as *Macoma,* in the North Pacific Basin. For instance, *M. middendorffi* DALL, 1884, a related Bering Sea species, with published records in the Miocene, Pliocene, and Pleistocene of the North Pacific, may represent the population which remained in the Pacific Ocean when *M. obliqua* traveled to and became isolated in the Atlantic-Arctic in the Pliocene.

A preliminary survey of literature indicates that another, now extinct species of boreal *Macoma* may have reached the Atlantic as early as the European Anversian (Miocene). Taxa that ought to be compared with one another in order to prove this are *M. albaria* (CONRAD, 1849), *M. virginiana* (CONRAD, 1866) (and its subspecies), and *M. elliptica* (BROCCHI, 1814) of GLIBERT (1958a, 1958b) and others.

LITERATURE CITED

BADEN-POWELL, D. F.W.
1960. On the nature of the Coralline Crag. Geol. Mag. 97 (2) : 123 - 132

BERTIN, VICTOR
1878. Révision des tellinidés du Muséum d'Histoire Naturelle . . . . Nouv. Arch. Natl. Mus. Hist. Nat. Paris (2) 1: 201 - 361; plts. 8 - 9

BRITISH MUSEUM (NATURAL HISTORY)
1963. British Caenozoic fossils, 2nd ed. London (Brit. Mus.) pp. i - vii + 1 - 133; plts. 1 - 44

BROCCHI, GIOVANNI BATTISTA
1814. Conchiologia fossile Subapennina con osservazioni geologiche sugli Apennini e sula suolo adiacente. Milano (Dalla Stamp. Reale) 1: 1 - 56 + i - lxxx + 1 - 240; 2: 241 - 712; plts. 1 - 16

CONRAD, TIMOTHY ABBOTT
1849. Fossils from northwestern America. *In* J. D. Dana "Geology: United States Exploring Expedition, during the years . . . , under the command of Charles Wilkes, . . ." 10: 723 - 728; plts. 17 - 21
1866. Note on the genus *Gadus,* with the descriptions of some new genera and species of American fossil shells. Amer. Journ. Conch. 2 (1) : 75 - 78 (1 January 1866)

DALL, WILLIAM HEALEY
1884. Report on the Mollusca of the Commander Islands, Bering Sea, collected by Leonard Stejneger in 1882 and 1883. (Contributions to the history of the Commander Islands, no. 3). Proc. U. S. Nat. Mus. 7 (22) : 340 - 349; plt. 2 (3 October 1884)
1894. Notes on the Miocene and Pliocene of Gay Head, Martha's Vineyard, Mass., and on the "land phosphate" of the Ashley River district, South Carolina. Amer. Journ. Sci. (3) 48 [148] (286) [art. 42]: 296 - 301 (Oct. 1894)
1900a. Synopsis of the family Tellinidae and of the North American species. Proc. U. S. Nat. Mus., 23 (1210) : 285 to 326; plts. 2 - 4 (14 November 1900)
1900b. Contributions of the Tertiary fauna of Florida with especial reference to the Silex Beds of Tampa and the Pliocene beds of the Caloosahatchie River including in many cases a complete revision of the generic groups treated and their American Tertiary species. Trans. Wagner Free Inst. 3 (5) [Teleodesmacea: *Solen* to *Diplodonta*]: i - x + 949 - 1218; plts. 36 - 47 (December 1900)

GARDNER, JULIA ANNA
1943. Mollusca from the Miocene and Lower Pliocene of Virginia and North Carolina. Part I. Pelecypoda. U. S. Geol. Surv. Prof. Paper 199A: i - iv + 1 - 178; plts. 1 - 23

GLIBERT, MAXIME
1958a. Tableau stratigraphique des mollusques du Neogene de la Belgique. Bull. Inst. Roy. Sci. Nat. Belg. 34 (32) : 1 - 20 (October 1958)
1958b. Pelecypodes du Diestien, du Scaldisien et du Merxemien de la Belgique, 3me note. Bull. Inst. Roy. Sci. Nat. Belg. 34 (42) : 1 - 27; plts. 3 - 4 (November 1958)

HANLEY, SYLVANUS
1844. On new species of the genus *Tellina,* chiefly collected by Hugh Cuming, Esq., in the Philippine Islands and Central America [one section only]. Proc. Zool. Soc. London (for 1844) 14 [prt. 12] (138) : 140 - 144 (December 1844)

HOPKINS, DAVID M., (ed.)
1967. The Bering land bridge. Stanford, Calif. (Stanford Univ.) : i - xiii + 1 - 495; illust.

KEEN, A. MYRA & HERDIS BENTSON
1944. Check list of California Tertiary marine Mollusca. Geol. Soc. Amer. Spec. Pap. 56: i - viii + 1 - 280; 4 text figs.; 2 tab. (30 August 1944)

LINNAEUS, CAROLUS
1758. Systema naturae per regna tria naturae . . . editio decima, reformata 1 [Regnum animale]. Stockholm (Laurentii Salvii) pp. 1 - 824 + i - iii
1767. Systema naturae per regna tria naturae . . . editio duodecima, reformata 1 [Regnum animale] (2) : 533 - 1327. Stockholm (Laurentii Salvii)

MACNEIL, FRANCIS STEARNS
1965. Evolution and distribution of the genus *Mya,* and Tertiary migrations of Mollusca. U. S. Geol. Surv. Prof. Paper 483G: i - iv + 1 - 51; plts. 1 - 11

MIDDENDORFF, ALEXANDER THEODOR (VON)
1851. Mollusken *In* "Dr. A. Th. v. Middendorff's Reise in den äussersten Norden und Osten Sibiriens" 2 [Zoologie] (1 - Wirbellose Thiere) : 163 - 464, 505 - 508, 512 - 516; plts. 8 - 30. Saint Petersburg (Kaiserl. Akad. Wissensch.) (30 Sept. 1851)

Schrenck, Leopold Ivanovich (von)

1867. Mollusken des Amur-Landes und des Nordjapanischen Meeres. Reisen und Forschungen im Amur-Lande in den Jahren 1854 - 1856 im Auftrage der Kaiserl. Akad. Wissensch. zu St. Petersburg . . . 2 [Zoologie] (Mollusken): 259 - 976; plts. 12 - 30 (post-October 1867)

Sowerby, George Brettingham (2nd of name)

1867[1866 - 1869]. Monograph of the genus *Tellina* *In* Conchologia Iconica: or, illustrations of shells of molluscous animals, by L. A. Reeve **17** (2): plts. 1 - 58, each individually dated.

Sowerby, James

1817 [1815 - 1818]. The mineral conchology of Great Britain; or coloured figures and descriptions of those remains of testaceous animals or shells, which have been preserved at various times and depths in the earth. London (privately printed) **2**: 1 - 251; plts. 103 - 203

von Martens, Eduard

1865. Description of new species of shells. Ann. Mag. Nat. Hist. (3) **16** (96) [art. 49]: 428 - 432 (Dec. 1865)

Wood, Searles V.

1848. A monograph of the Crag Mollusca, with descriptions of shells from the upper Tertiaries of the British Isles 2 (Bivalves). Palaeo. Soc. **9**: 217 - 342; plts. 21 - 31

1874. Supplement to the monograph of the Crag Mollusca, with descriptions of shells from the upper Tertiaries of the east of England. Palaeo. Soc. **27**: 99 - 231; plts. 8 - 11 +1 more

Wood, William

1815. General conchology; or, a description of shells, arranged according to the Linnean system, and illustrated with plates drawn and coloured from nature, . . . **1**. London (John Booth). [only one volume ever issued]: i - lxi + 1 - 7 + 1 - 246; plts. 1 - 59, 4* (issued in as-yet undated parts, from 1814 to 1815)